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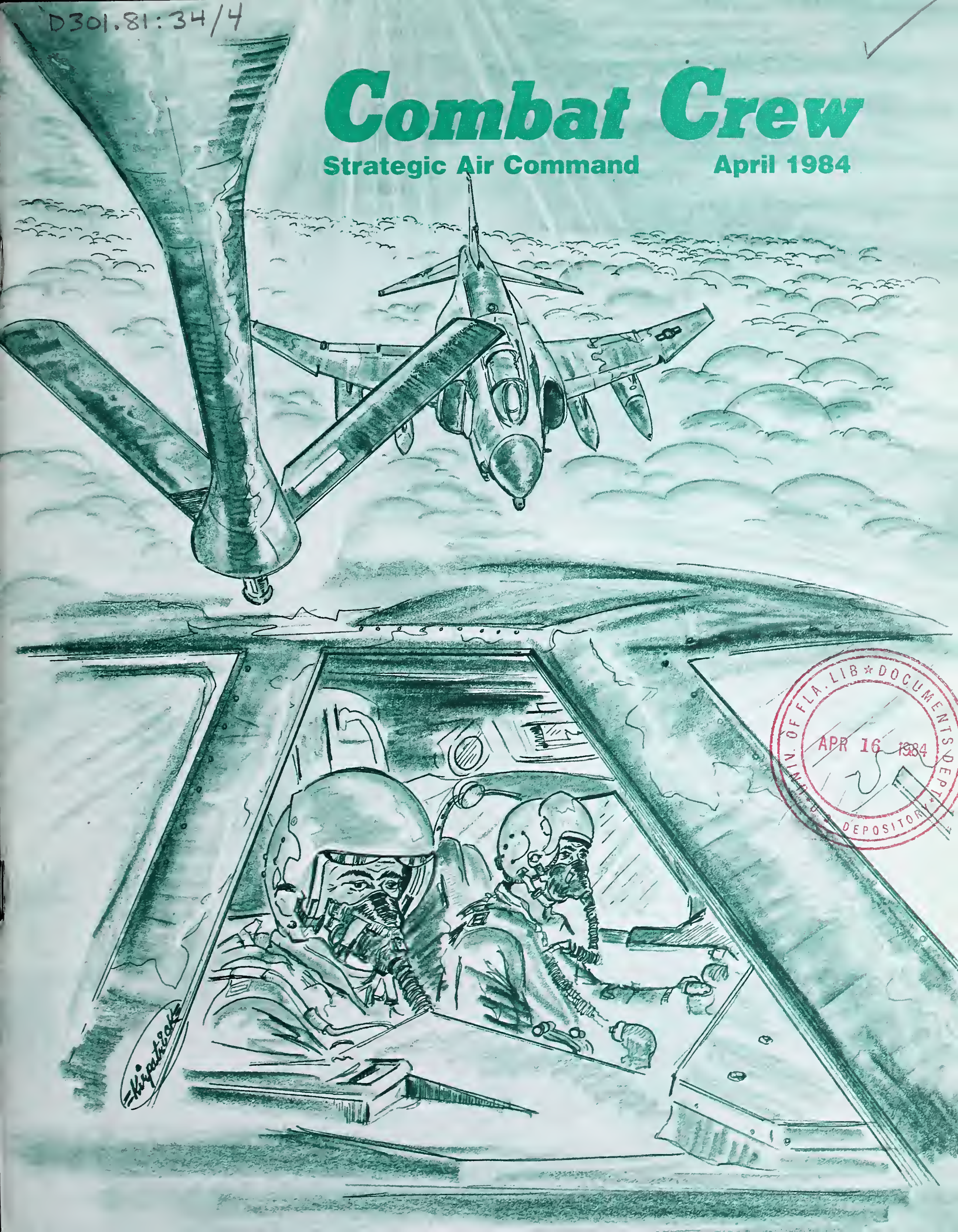
Combat Crew

Strategic Air Command

April 1984



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R_x For Airmanship—Discipline

My emergency approach had been going about as well as one could expect under the circumstances. As I rolled out on short final with my gear and flaps still up, everything seemed to be in order except for the unexpected power lines. It was a disadvantage working without an airspeed indicator, but I was finally able to gauge my speed as I got nearer to the ground. I was definitely carrying excess speed, therefore once across the power lines I had to consciously force my powerless aircraft into the trees. With the canopy open there was a great amount of noise as I clipped off varying amounts of 48 trees. In spite of the fact the plane was 95 percent totaled, I was uninjured. Strange how the events of that day in 1957 have faded very little despite the passage of many years. Equally curious is my clear recollection of our civilian flight commander's advice a week before — **"Never look for trouble in an airplane; it will find you."** How right he was!

The joys of learning to fly were no less exciting two and a half decades ago than they are today. The new experiences, the quest for technical knowledge, and the striving for mastery of the aircraft continue to provide special memories for those of us who have entered the magic kingdom of the flight environment. Airmanship does carry with it, however, great responsibility and accountability. We can and we must help control our destiny. Good airmanship is an individual responsibility.

In late November, about a week before my crash, a mass of moisture from the Gulf of Mexico was inundating Graham Air Base near Marianna, Florida. Since our class had only recently soloed in the T-28, ours was still a VFR environment, so we knew, as we splashed our way into the flight training building, we were in for a day of emergency procedure drills, trainers, and chalk talks. Our instructors were civilians, and they had all graduated from the school of hard knocks. Many had served in WWII and some had flown combat in P-51s or F-80s in Korea. They were marvelous pilots and superb instructors.

As that rainy November day wore on, we ran out of drills and trainers. Eventually, some of our most experienced instructors began to relate a series of flight experiences they had known over their many years of avia-

Combat Crew

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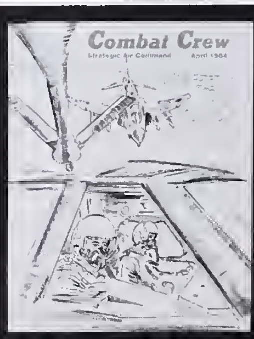

ON OUR COVER

Flying safely requires man
qualities — just to name
few are airmanship, disci
pline, and professionalism
See pages 14 and 18 fo
more details.

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tion — both in combat and peacetime military flying.

These were more than just "war stories." They had depth and meaning that richly illustrated the great many variables associated with flying. The collective message for us was to fly the airplane the way it was designed to be flown and within the bounds of flying regulations. Training, practice, planning, and technical knowledge were all important factors; but it was stressed that the key ingredient in a safe flying program was discipline. The person who had the self-discipline to prepare beyond the minimum requirement, the discipline to take maximum advantage of training time, and the discipline to comply with flying regulations and tech data — even when no one is there to judge — will be a successful aviator. This philosophy was embodied in the eloquently simple admonishment . . . **"Never look for trouble in an airplane; it will find you!"**

So a week later, when my engine froze, and my propeller departed the aircraft taking part of my right wing including my pitot tube, I knew our flight commander was right. He also had gone on to say one other thing — "**. . . the greatest flying claim one can ever make is that you have fulfilled an aviation career and never experienced an accident.**" I can never make that claim; but I hope you can.

While the 1983 aircraft mishap rate is the best the Air Force has ever known, we can do better. Materiel factors now influence less than 40 percent of our accidents. Aircrew discipline is the final ingredient that can lower the accident rate even further. *How is your airmanship? How is your discipline?*★

Brig Gen Jack K. Farris
HQ SAC Inspector General

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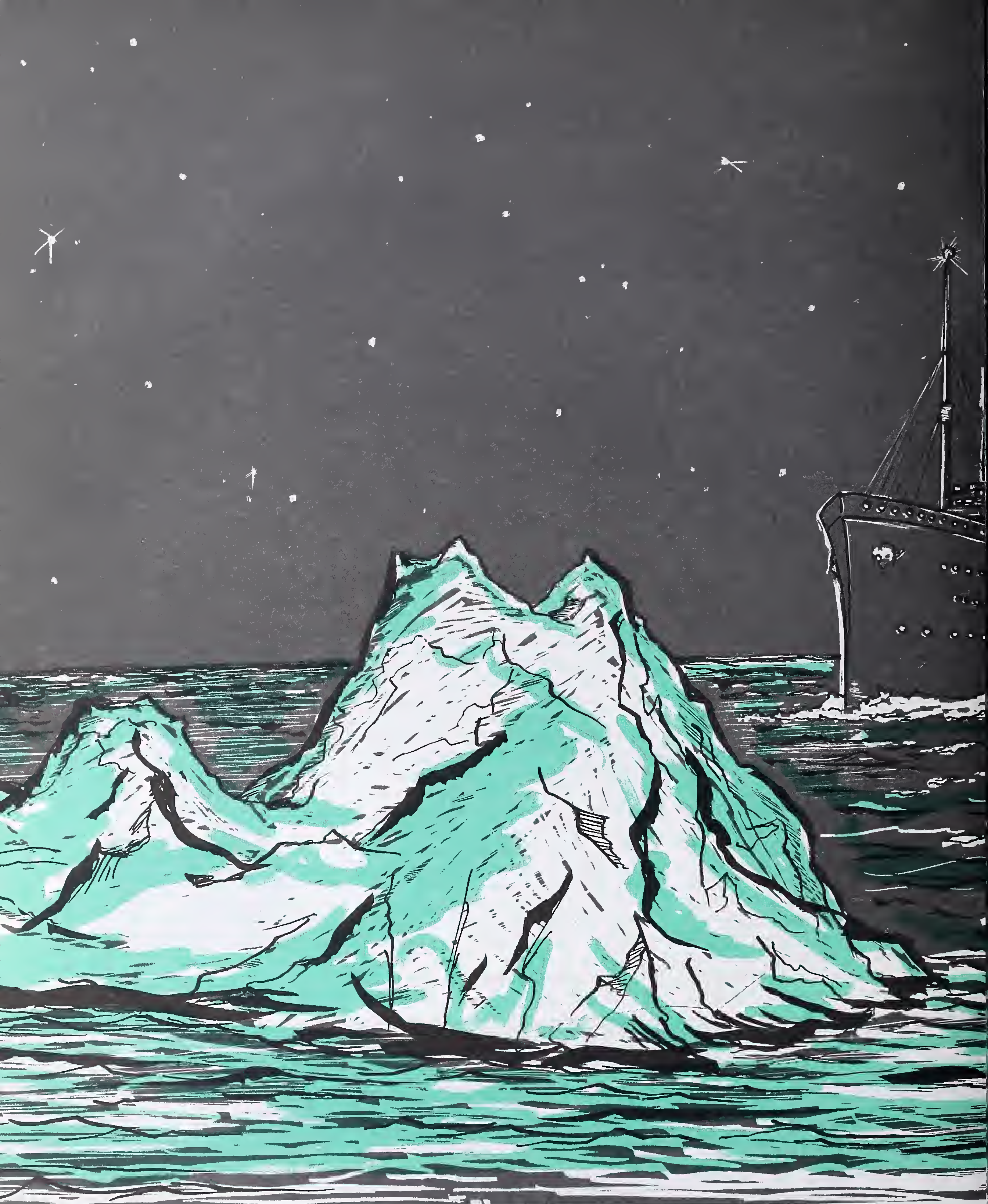


The Titanic

2Lt Thom Connell
44 SMW, Ellsworth AFB

Over 70 years ago, the lawmaking agencies and shipping industry, entrusted with the safety of passengers and crews at sea, neglected the obvious need to drastically update safety requirements and crew training. This was necessary due to the rapidly changing technology which produced bigger and heavier ships.

Herein lies an interesting parallel between the complacency of lawmaking bodies then and the safety attitudes today of some of our supervisors and co-workers — regardless of the tragedies we still suffer.

Being a "*Titanic* addict" and perpetual student of the disaster, I've found that three basic areas contributed to the grand ship's demise: ignorance, disregard for procedures and hopeless bureaucracy.

In this story I'll highlight examples from these areas in terms of our job requirements and training in hopes that we learn from the past rather than being doomed to repeat it.

The *Titanic* disaster begins at the docks of Southhampton, England, on April 10, 1912. A passenger seeing the ship for the first time commented that the *Titanic* rose from the water ". . . like the side of a cliff." It was truly a wonder of modern technology.

Four city blocks long, weighing 46,000 tons, this was more than just a ship — it was a floating palace. A palace complete with elevators, libraries, a dining room for over 500, even first class quarters for first class dogs.

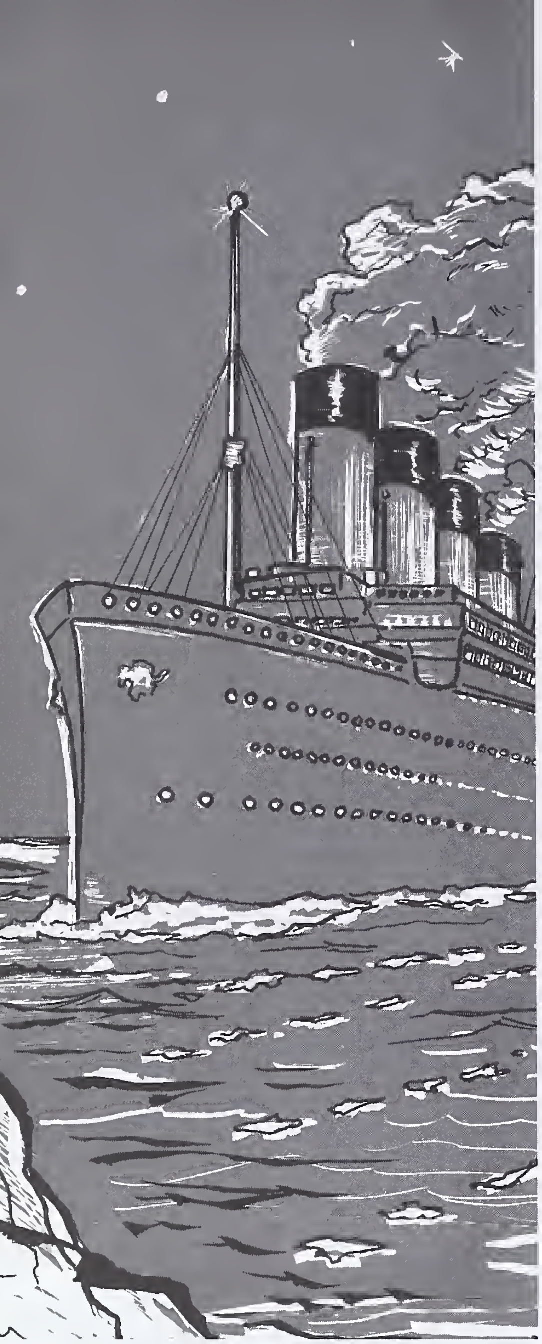
> **"Herein lies an interesting parallel between the complacency of lawmaking bodies then and the safety attitudes today of some of our supervisors and co-workers — regardless of the tragedies we still suffer."**

In comparison, the *Titanic* would have made the "Love Boat" look like an Appalachian outhouse. The height of 1900's luxury was available on the *Titanic.* If you had the money, perhaps one of the ship's "millionaire suites" would have interested you. One-way ticket price: $4,300. These however had already been booked far in advance. On board were more than a few who could easily afford such luxury: real estate giant J. J. Astor, mining and smelting magnate Benjamin Gugenheim, and international banking's Isador Straus. In fact, the collective value of the first class passenger list exceeded 500 million dollars.

The *Titanic,* however, wasn't all glitter and fluff. Structurally speaking, the *Titanic* was a turn of the century technical marvel. Everything on board was built to a gargantuan scale: 16 boilers — each big enough to hold a double-decker bus — produced 50,000 horsepower capable of propelling the ship to a speed of nearly 25 knots.

Also, imagine yourself flying a mission and being forced to bail out, only to find there were parachutes for less than half the crewmembers. Imagine, if you can, that SAC directed this reduction in parachutes because the aircraft you're flying is designed in such a way that an emergency requiring a bailout just couldn't happen. Yet, the *Titanic* was operating under these exact attitudes.

The *Titanic* was traveling the Great Circle Track, the most direct route across the North Atlantic. Here, again, is another blatant disregard for safety. The Great Circle Track was safe only during late Autumn and early winter. Travel this course any other time of the year and you'll see endless floes of pack ice stretching for miles and towering icebergs too numerous to count. The White Star Line wanted a record setting crossing, and was willing to gamble with the lives of the 2200 people on board. Even today, we sometimes come in contact with this dangerous attitude of disregarding safety for meeting "short fuse" deadlines.



There was no limit to the crew's unfamiliarity with the *Titanic.* Take, for instance, the lifeboat lowering mechanisms. These were unique to the *Titanic.* They were complicated at best and not one crewmember knew how to operate them. Additionally, there had been no lifeboat drills. This Sunday, inexplicably, no drill was held. Regardless of the crew's lack of training, the North Atlantic was treacherous and ready to test the "TDY" crew and their lifesaving procedures. It was nearly time.

Ice reports were being received from other ships far south of the *Titanic.* These were general condition reports but were taken to the bridge anyway to provide the captain with current information. The operators were very busy transmitting passengers' telegrams to Cape Race, Newfoundland. The *Titanic's* operators were behind the power curve because their transmitter had broken down and many hours had been spent trying to repair it. They were feverishly trying to catch up when they received an urgent ice warning from the *SS Californian:* ". . . We are at full stop . . . surrounded by ice . . ."

Here was the third deadly variable: disregarding proper procedures. The *Californian* radio operator didn't check for other radio traffic when he broadcast his urgent ice warning. The *Californian* was relatively close and its broadcast nearly blanked out the Cape Race signal to the *Titanic.* The *Titanic's* operators were enraged and fired back the message, ". . . shut up . . . shut up . . . (expletives delted) . . . I'm working Cape Race."

The offended *Californian* operator did exactly what he was told. In a huff, he turned off his radio equipment, then crawled in his bunk and went to sleep — in direct violation of Marconi regulations which dictated that he stay awake due to the dangerous ice conditions. But the *Titanic's* operators likewise ignored procedures when they failed to take this urgent ice warning to the bridge. Worse though, was that they had failed to take a handful of other urgent ice warnings to the bridge also.

If these urgent ice warnings had been taken to the bridge and plotted on a navigational chart, the positions would have formed a rectangular field of icebergs and pack ice over 20 miles long directly in front of the *Titanic,* which thundered on at 22 knots — the fastest she would ever travel.

The *Titanic* was advertised as the safest ship afloat. The White Star line, owners of the *Titanic,* boasted the ship would remain afloat with even the two front water-tight compartments flooded. This was quite a boast and yet, technically accurate. This is where the unsinkable reputation came from. In the "unlikely event" of an emergency, watertight doors could be shut throughout the ship sealing off the damaged compartments, thereby preventing the flooding of other undamaged compartments.

These watertight compartment walls, or bulkheads, rose from the bottom of the ship to at least four levels above the waterline. Ship's engineers were confident that their bulkheads rose high enough up into the ship so that if the worst ever happened — a head on collision — the flooding would be contained to the front two compartments. Their calculations told them that in this condition the *Titanic* would handle sluggishly but that the ship would still remain nearly level in the water. So confident were the crewmembers in the design of the Titanic, that one purser explained to a passenger that "even God couldn't sink this ship."

From the beginning of the *Titanic's* construction, it should have been obvious to someone that this ship would be completely different from all the others. The *Titanic* was christening a new era in ocean travel and operations. As a result, extensive training should have been required — especially in the areas involving safety of passengers and crew. No one on board the *Titanic,* however, knew how to competently handle a ship its size. Even as the ship moved slowly from the well-wishers on the docks as it departed on its maiden voyage, the *Titanic* was immediately involved in a serious near-collision. This incident clearly illustrated how unfamiliar the crew actually was when it came to maneuvering the *Titanic.*

As the great liner lumbered by an adjacent steamer, the *New York,* the moored steamer heeled over sharply due to the powerful suction force generated by the *Titanic's* size and twin 38 ton screws. The *New York's* steel cables snapped loudly as the steamer was forcefully drug from her dockside towards the *Titanic.* As passengers aboard the *Titanic* watched the *New York* swing quickly towards the *Titanic,* the *Titanic's* captain momentarily increased the RPM's of the port engine and literally "blew the *New York* away" from the *Titanic.* It was later discovered that this terrible suction force had drug a large sunken barge 800 yards across the harbor bottom.

When it came to actually operating the *Titanic* under "real life" conditions, it was strictly new territory for the crew — even though most were experienced seamen. There were a couple of reasons for this.

Just prior to the *Titanic's* voyage, a coal industry strike had forced the White Star Line to cancel many of its other ocean liner crossings in order to meet the coal requirements of the *Titanic.* The floating palace required 650 tons daily. This "resource transfer" involved more, however, than coal. Passengers — as well as crewmembers — were also transferred. As you will see, a crew, unfamiliar with the operations of their new ship, added to the already existing safety problems (which I'll explain shortly) would prove to be the perfect — deadly — mix.

Crew performance, though, wasn't the only dangerous variable. Bureaucracy, red tape, and complacency were also significant contributors. Here comes the bottom line: Although the *Titanic* had barely half the number of lifeboats needed, it had more than the legally required amount.

Hindsight, it always seems, is the only vision unaffected by age. Even today when reviewing an accident report, one wonders why the victims didn't see what was blatantly obvious. It's no different now than it was during the British and American board of inquiries into the *Titanic* disaster. The lifeboat situation is a prime example.

The British Board of Trade had failed to keep safety requirements current with the increase of ocean liner capacities. When the *Titanic* departed England the lifeboat regulation still stated that ". . . any vessel exceeding 15,000 tons should provide no less than 16 lifeboats." The White Star Line provided four additional canvas-collapsible lifeboats, bringing the total to 20. Apparently the White Star Line felt they were able to "meet and exceed operational requirements," regardless of the fact that the *Titanic* exceeded the tonnage specified in the regulation three times over. When filled, these lifeboats had maximum capacity of 1178 — over a thousand less than needed to safely evacuate passengers and crew.

With ever-clear hindsight, it seems nearly everyone knew about the lack of lifeboat space, yet nothing was done about it. A polite controversy was carried on in trade publications and magazines long before the *Titanic* sailed because the chief designer had originally proposed 50 lifeboats. His proposals and demands, however, were eventually crushed beneath the bureaucratic, big-business tank treads. After all, the law only required 16 . . . and the *Titanic* was unsinkable. This was preposterous, yet nothing was done to remedy the obvious danger. Don't think for a moment that this type of thinking went down with the *Titanic* either.

Have you ever found a safety hazard in your work area that nearly everyone knew about, yet nothing had been done to correct it? The AF Form 456 is not a complicated piece of paperwork. In it you can identify the safety problem. The situation will be investigated and if need be remedied. If the hazard remains, it will only be a matter of time before equipment is damaged, and someone killed or injured — and it might be you.

Survivors later said the ocean was "calm as a mill pond" that night and the sky brilliantly clear. High above the deck in the lookout perch, two seamen watched the horizon in the bitter cold. Binoculars would have been helpful, but there weren't any on board. The two shivering lookouts spotted something in the water less than a few hundred yards away. They continued to watch it until it began to take shape.

ICEBERG! They screamed into the telephone, "Iceberg right ahead!" Orders were instantly relayed. "Hard a starboard . . . full speed astern." Watertight doors throughout the ship began closing. The lookouts watched the iceberg as it seemed to grow in size until it towered 75 feet over the ship. It ravaged the great liner's side, dumping more than a ton of ice onto the decks as they roared past it. Then like a predatory animal striking in the night, it silently disappeared back into the darkness.

On the bridge, crewmembers felt the engines break rhythm. In the dining room, crystal goblets rattled against the silverware. In the bakery below decks, pastries for the next day scattered onto the shiny floor. Down in the bowels of the ship though, where men still shoveled coal into the boilers, it was much different. Without warning, the thick steel double bottom of the *Titanic* peeled open as if it was made of foil. The cold Atlantic water exploded in on them with a deafening roar. In only ten seconds, the iceberg had left a 100-yard gash across the front six right compartments only ten feet above the keel.

The Titanic was doomed. The *Titanic's* captain, awakened by the duty officer, sent ship's engineers scurrying throughout the *Titanic* for a damage assessment. The engineers returned shortly with sobering news: the great ship had less than three hours remaining. Here's why.

Design engineers built the ship to float level with the front two compartments flooded. In this way, with the help of the watertight doors, the water would be contained to these two compartments. With these compartments flooded, and the ship level, the water wouldn't come close to the top of the compartments, so it was decided that the "ceilings" didn't need to be made watertight. In fact, most of the ceilings were made of metal bar grating. In some compartments, you could stand on the fourth or fifth level and look through the metal bar gratings all the way to the bottom of the ship. The *Titanic* could remain safely afloat with the front two compartments flooded. But with six on one side, the ship would not remain level and the water would fill one compartment to the top, then spill over into the adjacent compartment, filling it, and the next and so on. In the time the engineers took to examine the *Titanic* and explain their findings to the captain, the ship was already listing five degrees.

It was hopeless. Until 1912, the international distress call was C-Q-D. Just prior to the *Titanic's* departure, the distress call had been changed to the more distinctive S-O-S. Ironically, the unsinkable *Titanic* was the first ever to broadcast an S-O-S.

Ships within hundreds of miles responded to the distress call. Closest was the *Carpathia.* She was 58 miles south and radioed she was turning for the *Titanic*. It would take at least four hours.

After many different and dangerous attempts to lower the lifeboats, they were successfully put into the water. It had taken over two hours to load and lower the boats. Oddly, survivors said the mood on the decks was calm and quiet. The only confusion they reported was who and how to get into the lifeboats. No one actually expected the *Titanic* to sink. Most thought it was precautionary.

Finally though they were gone. Fifteen hundred men, women and children stood on the ever slanting decks watching the little white boats inch their way backwards from the fatally wounded ship. Then, on the horizon, a ship was sighted. It was no more than ten miles away. Hopes ran high. It seemed help had arrived just in time. Distress rockets were fired to attract the ship's attention. In all, eight were fired and as you will see, were almost completely ignored by the ship within sight of the helpless passengers.

"ICEBERG! They screamed into the telephone, 'Iceberg right ahead!' Orders were instantly relayed. 'Hard a starboard . . . full speed astern.'"

Precious time was running out. By now, nearly half of the *Titanic* was underwater. The lights below decks still shining through the cabin windows bathed the surrounding sea in an eerie green. Still, the ship within sight of the *Titanic* refused to answer their rockets or radio calls for help. It was the *Californian.*

At about eleven that fateful night, Captain Lord of the *Californian* was told lights had been sighted from an approaching steamer. Lord ordered radio contact to be made and to relay that the *Californian* was at full stop due to ice. The message was transmitted and the *Titanic* fired back its caustic response: "Shut up . . . shut up . . . I'm working Cape Race . . ."

Now though, nearly three hours later, as the *Titanic* slowly crept under the water, the first officer on the *Californian's* bridge watched the *Titanic* — through binoculars. He commented a ship wouldn't be firing rockets at sea for nothing so he went to wake up Captain Lord. The captain asked if they were international distress colored rockets (they were). He thought a few seconds, nodded and went back to sleep. Back on the bridge, the first officer resumed his observation saying that it appeared the ship was steaming away, slowly disappearing. Aboard the *Titanic,* that's precisely what was happening.

Those remaining on the *Titanic* began reverently reciting the Lord's Prayer as they quietly crowded the stern. Then, the ship shuddered violently and took a menacing twist, shattering the calm which, to this moment, had prevailed. Hysteria took over as the forsaken realized now that help would never arrive. There was no place to run.

Those in the motionless lifeboats watched silently as their abandoned loved ones shrieked and pleaded. Abruptly, the lights went out signaling the beginning of the end. Then the boilers exploded in a roar that blasted through the night. This was the final blow. The hull, disembowled by the explosion, surrendered to the ocean. The stern raised up quickly and stopped in a perpendicular position. Here it stood for a few moments: a dripping monolith to man's overconfidence. Then, with gathering momentum, the ship "that God himself could not sink" plunged forever to the bottom of the icy Atlantic.

The confusion continued long after the *Titanic* sank. Many in the lifeboats decided not to go back for survivors for fear of a huge whirlpool. In one of the boats the **passengers** decided it was too dangerous, so they too rowed away.

Whatever the reasons, of the 1500 left thrashing in the 30° water, only 13 were picked up by those in the lifeboats. In fact, it would be learned later that in the confusion to get the lifeboats away, most weren't even filled. They had a capacity of over 60, yet most didn't have half this amount. Boat one had only 11 in it and six of them were crewmembers. When all the statistics were tallied, the ratio of crewmembers to passengers saved was an astonishing 27:1.

The *Carpathia* arrived at the scene about dawn that morning and began plucking shivering survivors from their lifeboats. On the *Californian,* Captain Lord ordered the radio operator to find out if anything unusual had been reported the previous evening. In minutes, the operator rocketed up the stairs with the shattering news: The *Titanic* hit an iceberg and sank! Captain Lord quickly ordered the ship to steam for the *Titanic's* last reported position.

Meanwhile, the *Carpathia* slowly steamed over the *Titanic's* grave in a last attempt to locate survivors and then turned for New York. As they left, someone managed to snap a terribly incriminating picture of the *Californian* as it arrived on the scene to lend assistance. This picture, and the testimony of all other parties concerned, clearly singled out Captain Lord as the one person who had the chance to save nearly **everyone** — yet chose not to.

This was outrageous. In the opinion of the American and British inquiries, ignoring distress rockets from a disabled ship was the most heinous offense of which a mariner could ever be guilty. Captain Lord's career also went down with the *Titanic* and he spent the rest of his 84 years trying to clear himself of the stigma.

The *Titanic* disaster is an incredible story, packed with lessons to be learned — especially in the area of safety. Know-it-all attitudes, disregarded procedures, inadequate training, poorly written guidelines and regulations together made up a parade of blunders that formed a web of circumstances from which the *Titanic* could not escape.

These lessons can be applied to **all** of us, whether we're maintenance, flyers or missileers. The training we get is to prevent us from finding ourselves in a similar deadly situation where unsafe conditions meet with unpreparedness. Obviously, readiness was another variable in the disaster. That's another story. But, oh, what a story.

Plane Facts About Takeoffs

Major Robert W. Kopp,
Chief, SAC CFIC Division

Major John J. Richard,
B-52 Pilot Specialty Chief

Lately the command has experienced a significant number of reported extended takeoff rolls in the B-52. These incidents are neither model specific nor defined by specific weather criteria, i.e., wet runway, extreme temperature, heavy crosswinds, etc. In some of these instances maintenance and BMAC personnel have found faulty or improperly installed parts within the wheel brake system. But, none of these findings have produced conclusive evidence that the cause was dragging brakes.

It is common knowledge among *"Buff Drivers"* that the wheel brake system is one of the weakest components of our venerable old war machine. We always consider this for landing (no drag chute), but seldom consider it during takeoff. How often have you computed brake energy limits for a takeoff aborted at S_1 speed? Try it next time, you may be surprised.

As pilots we like to take pride in our systems knowledge and flying skills. Sometimes it's more than just mere pride, it's a matter of survival. Well, when was the last time you sat down and thought about the takeoff procedure in detail? We don't mean cross the hold line, roll out on the centerline, advance the power and go. We mean sit down and dissect that takeoff procedure, step by step, and analyze each and every part of it and all the factors which can affect your computed takeoff distance. CCTS or CFIC you say! It's been a while, hasn't it?

As aviators we know that there are many factors we control which can affect our takeoff distance. For the sake of a good review, let's take a look at them. If you refer to the sample problem in Figure 1, you will see the affect each one of these variables has on your computed takeoff distance.

PILOT TECHNIQUE — Most of us brief the other pilot to give a 5 knot warning before unstick and use it as our cue for applying back pressure. What happens when we delay the back pressure and unstick at S_2 plus five knots? The accompanying chart (Fig 1) illustrates an 1150 foot increase in our takeoff roll for a 400,000# G model, dry, MRT takeoff. The dash one procedure calls for back pressure 5-10 knots below S_2. A better technique is to use a ten knot warning.

TAILWIND — The performance manual states, "Downwind takeoffs are not recommended" and that's good enough for us. Usually, by the time you work out downwind data you could have taxied the length of the runway and launched in the other direction. But, have you ever had the winds called "calm" and noted the wind sock wagging at your tail? Or (and be honest) have you ever ignored a five knot tailwind and just delayed unstick for 5 knots to compensate for it? (reread the last paragraph) You have just extended your computed S_2 distance 2000 ft.!

LINEUP DISTANCE — Another item we should consider is lineup distance. For a normal rolling takeoff we'll use 200 feet. This distance is computed from the end of the runway to the point where we apply takeoff power (partial thrust for a wet takeoff) and determines the runway available. This distance is slightly (40 feet) more than the length of the fuselage. What happens if we actually use 500 feet to lineup? We add 300 feet to our perceived takeoff distance.

POWER APPLICATION — The tech order states the minimum time from idle to maximum allowable position is 3 to 4 seconds for the G model (idle to thrust gate is 2 to 4 seconds for H model). This is also the maximum time and every second delay adds to the takeoff distance.

THRUST SETTING — For every takeoff we make, we compute a thrust setting. Obviously if minimum (computed) takeoff EPR is not developed, the calculated unstick point will not be met. Figure 1 illustrates the effect an average of .10 EPR (.05 in H) below the computed power setting will have on takeoff distance. The dash one states there is an increase of .02 EPR between 50 and 80 knots caused by ram effect. However, BMAC engineers state that between 0 and 80 knots a ram effect increase of .10 is possible. Constant adjustment to EPR during the ground roll will effectively reduce planned thrust and increase takeoff roll.

STABILIZER TRIM — Stabilizer trim setting is one of the most critical factors affecting our takeoff performance. We know that with the proper takeoff stabilizer trim setting, the B-52 cannot be rotated about the rear gear until the speed is within five to ten knots of unstick. Figure 1 illustrates the effects of miscomputed stabilizer trim on takeoff distance. Have you ever read the wrong side of the stab trim chart (nose down vs nose up)?

CONTROL TECHNIQUE — Figure 1 illustrates the effect of excessive lateral control inputs to maintain wings level during takeoff. We've estimated that excessive rudder control to maintain centerline will have the same effect.

Up to this point we have discussed the items which are critical to a normal takeoff on a dry runway with no crosswinds. But, what about you aviators in the northern tier or in Texas where the weather isn't always "clear and a million"? Yes, we're being facetious. Let's face it though, we don't always takeoff when it's clear and beautiful. So let's review some adverse weather situations.

FIGURE 1

	"G"	"H"
Aircraft Gross Weight	400m	400m
Temperature	60	60
Pressure altitude	0′	0′
Computed thrust setting	MRT	1.57
Computed S_2 distance	7000′	6000′
No back pressure 5-10kts below S_2 (5% increase)	350′	300′
Unstick at S_2 + 5 knots*	800′	700′
2 knot tailwind*	400′	300′
5 knot tailwind	1200′	900′
Anti-ice 5%	350′	NEG
Wet runway 6.7%(*)	470′ (400′)	400′ (300′)
.05 decrease in EPR 7½%	—	450′
.10 decrease in EPR **	800′	—
1 unit of nose down stab trim* 10%/unit	700′	600′
3 seconds late setting power (G: 3-4 sec) (H: 2-4 sec)	100′	100′
Hold ESP until unstick 10%	—	600′
1 engine dry 3.8% (Based on S_2 distance of	195′	—
2 engines dry 7.4% 5150′ for wet takeoff)	380′	—
Spoiler deflection 1%***	70′	60′
Centerline control***	70′	60′
Data computation		
Temp 5/10	200′	250′
PA 200′	50′	100′
GW 5000#	50′	150′
Other factors affecting perceived S_2 distance:		
line up distance 500′ vs 200′	300′	300′
runway remaining markers not exact $\frac{11,800-11,000}{2}$ =	400	400′
peripheral vision – actual vs perceived S_2		

BASIS FOR DATA
*BMAC
**Worked Charts In Reverse
***Estimated

CROSSWIND CRAB — When the winds are other than down the runway, the tech order tells us to set crosswind crab into the wind. This setting is computed based on wind velocity, crosswind component and aircraft gross weight. If too much or too little crosswind crab is set for takeoff, the result will be scrubbed tires during the takeoff roll and extended takeoff distance.

ENGINE ANTI-ICE — The tech order tells us that under certain weather conditions we should use engine anti-ice during takeoff. It also tells us that the takeoff distance will be 5% longer if we do. Figure 1 illustrates the affect of anti-ice on takeoff distance.

ENGINE STALL PREVENTION (ESP) — You H model drivers have an engine stall prevention system for use at low speeds during takeoff with strong crosswinds. You pay a penalty for using ESP. Figure 1 illustrates the effect of ESP held until unstick.

WET RUNWAY — Our performance manual warns us about taking off with water or slush on the runway. It mentions depths of .3 and .4 inches, but primarily for aborted takeoff considerations. Ever wonder what that water or slush will do to your takeoff distance? Figure 1 will show you. Assume a wet runway (.1 inch of water) and note your takeoff roll penalty.

DATA COMPUTATION — We've included the results of a maximum increase in the parameters for takeoff data recomputation for a comparison to all the above factors. It's interesting to note that these factors have significantly less affect than many of the other things we may have done to ourselves over the years!

JUDGING TAKEOFF DISTANCE — We all know that peripheral vision affects our perception of S_2 distance. But, are you aware of what the runway remaining markers actually tell you? Civil Engineering divides any excess distance over an even thousand feet of runway by two and adds the result to each end of the runway. Thus at Castle, for example, the one thousand remaining marker actually is 1400 feet remaining. What about your runway?

The intent of this article is not to alarm you to the point that your next takeoff is a "white knuckled" event. But, rather, to churn up the gray matter so you will approach your next takeoff with confidence and intelligence. Most of the data presented here is in your dash one. Take a few moments during your next mission planning day to consider what could happen to extend your next takeoff roll (see Figure 2 for an example). By the way, when you finish, pass this along to your tanker buddies who flipped the page as soon as they saw "B-52". Then ask to see their takeoff data adjustment checklist for these and other factors. They may also find the information we've presented valuable.

FLY THE AIRCRAFT

FIGURE 2

This Could Happen To You

Planned S-2	7000
2 Knot tailwind ("Calm")	400
Adjust EPR at 60 knots (yields 0.10 Low)	800
Stab trim one unit off (.5 down vs up)	700
Spoilers to raise a wing	70
Steering to maintain centerline	70
Five (5) degree increase in temperature	200
No back pressure prior to unstick	350
	9590

Additionally, due to insufficient back pressure you may unstick at a higher speed, which will add to the takeoff distance. S_2 + 5 knots = 800ft

RESULT, new S_2 distance of 10390 feet

CROSSIFCHECK

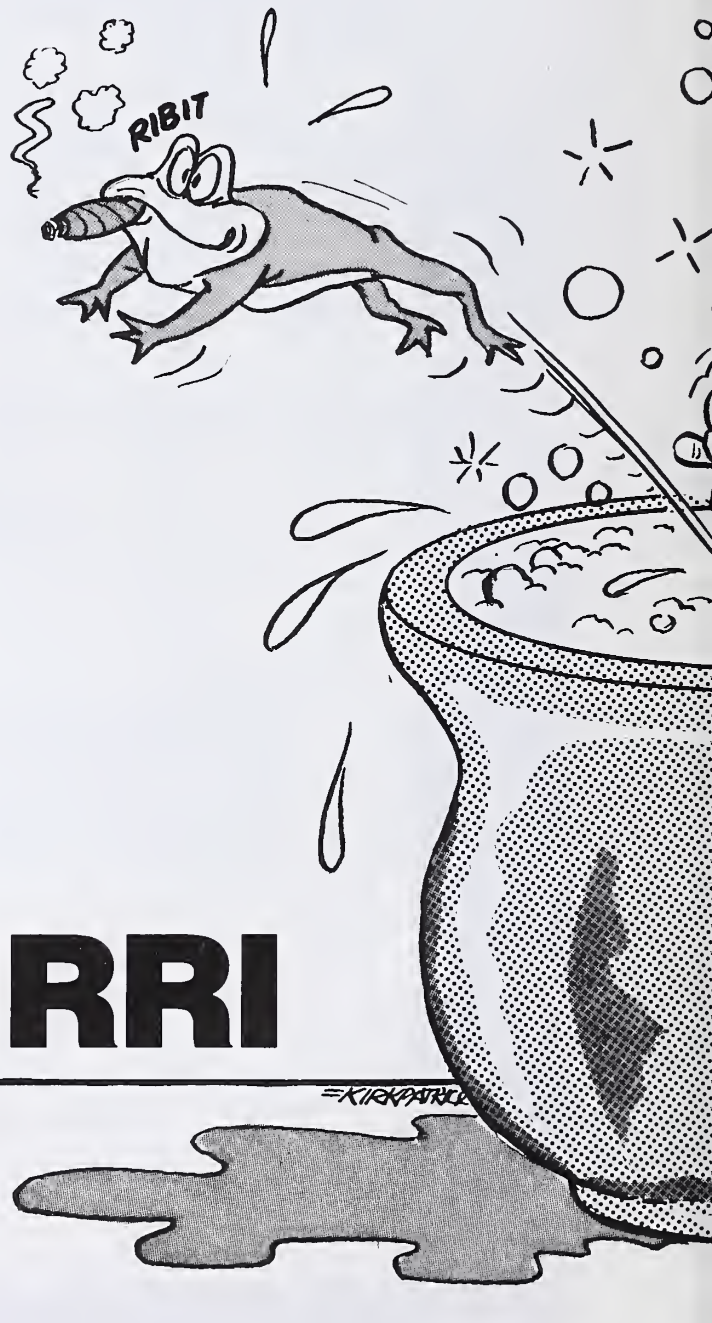
SIFC — Command Instrument Division

POTPOURRI

This particular episode of the "Crosscheck" takes a breather from our usual articles. After the January '84 installment on End Air Refueling Clearances we need time to get our "wind" back. The phone still hasn't stopped ringing from that one! This month's report is an update of some of the important (but less controversial) subjects that have floated over our desks recently.

• That question again . . .
The air staff is now working for a solution to the question of EAR clearances that will serve the mission, and remain consistent with the requirements of the ARTCC system. By now the interim explanation adopted with ATC coordination is in your FCIF, and we're sure the final answer will be forthcoming soon.

• 135 RNAV . . .
FAA Advisory Circular 90-82 addresses the subject of RNAV. There is some confusion regarding its applicability to the KC-135 fleet. The circular authorized aircraft equipped with coordinate navigation capability to file and fly random RNAV routes between approved departure and arrival fixes, provided the enroute altitude is FL 390 or above. However, the procedures apply only to aircraft certified for RNAV operations, and the KC-135 currently is not certified. SAC is working out the details for obtaining RNAV certification for the KC-135 INS/DNS equipped aircraft from the FAA. As soon as certification approval is granted, we'll let you know.



• **USAF/IFC interface . . .**
Hq SAC has designated SIFC as the point of contact for coordination of instrument matters with the IFC. If you have questions concerning instrument operations, call the SIFC for assistance.

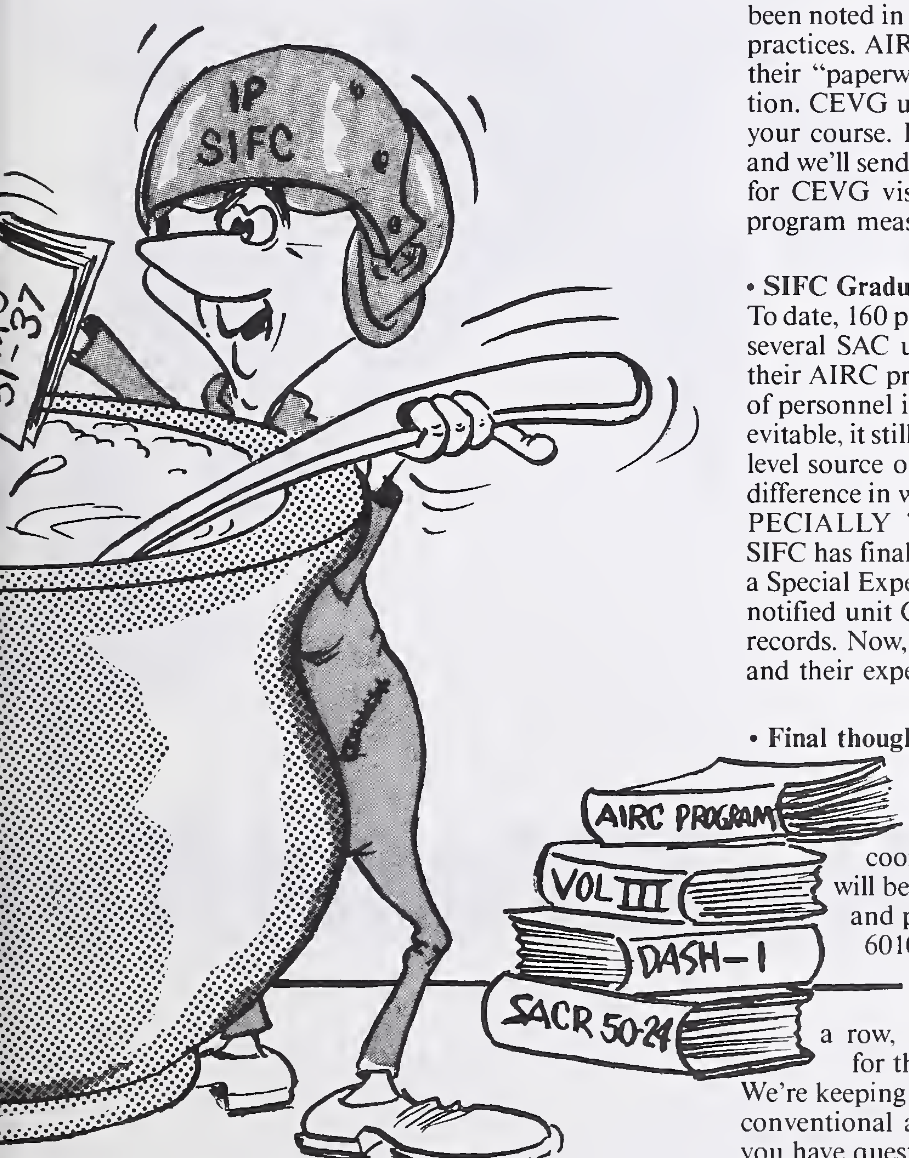
• **AIRC notes . . .**
SACR 50-24 Vol III dated 28 December 1983 contains the most current information pertaining to unit AIRC program management. Several changes to the G-90 course requirements and responsibilities should be noted. AIRC instructors and wing DOTs must coordinate to insure proper scheduling of AIRC events.

You will also note changes to the course, "Weather Criteria and TERPS Training," including the title: Approach Procedures Training, and course code: G-105.

Other volumes of SACR 50-24 will be changed to reflect these updates in due time, but for now, take a look at Vol III for the new format.

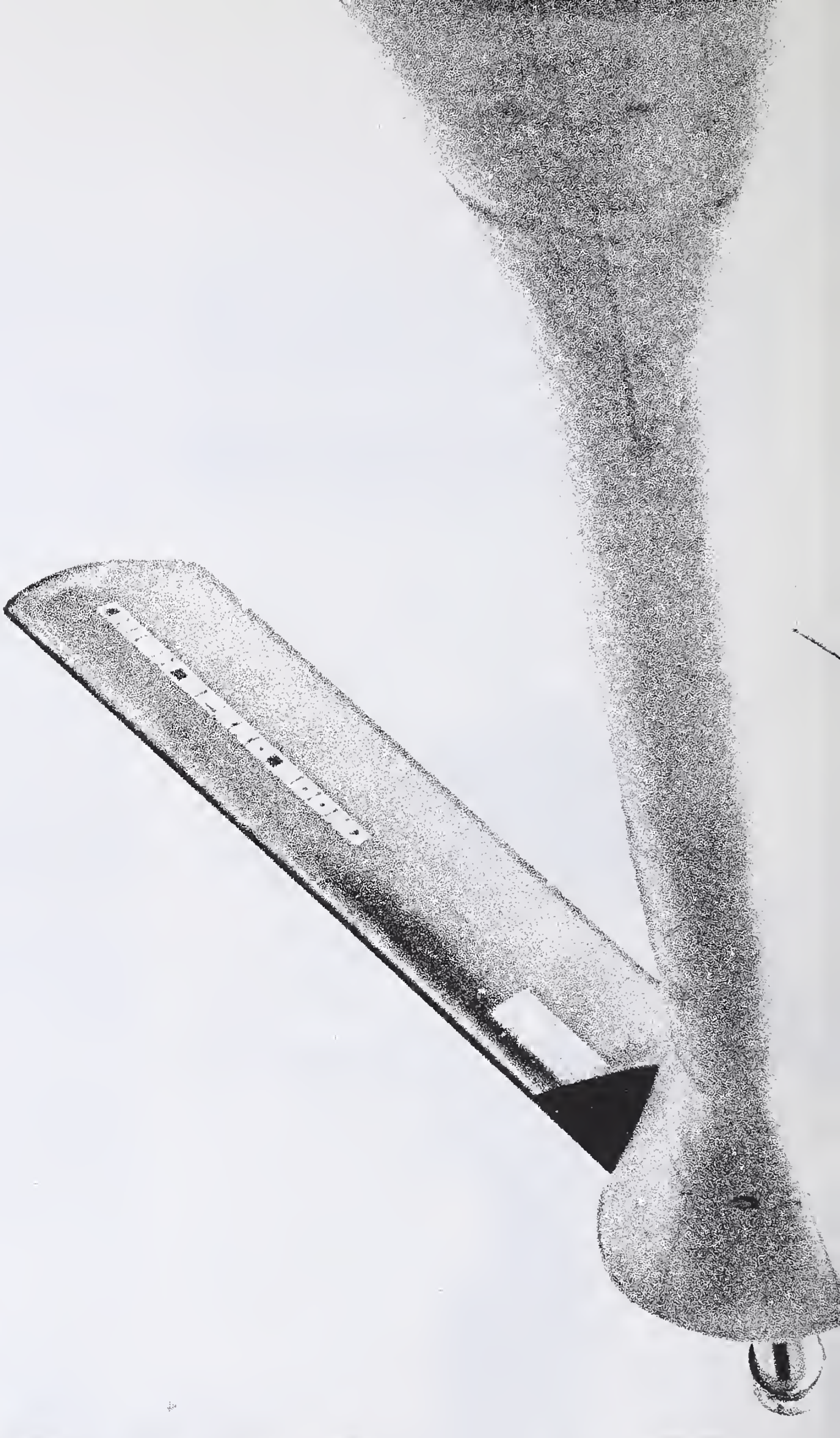
A couple of recent 1 CEVG evaluations of unit AIRC programs indicate a need for closer attention to administrative details. Instructors are doing a super job presenting the classroom material, but shortfalls have been noted in exam security and overall documentation practices. AIRC OIC's are responsible for insuring that their "paperwork" is as flawless as the actual instruction. CEVG uses standardized checklists for evaluating your course. If you don't have a current copy, call us and we'll send you one. With the very little notice given for CEVG visits, now is the time to make sure your program measures up.

• **SIFC Graduate utilization . . .**
To date, 160 pilots have graduated from SIFC. However, several SAC units are not utilizing SIFC graduates in their AIRC programs. Realizing that a constant shuffle of personnel in the local organizational structure is inevitable, it still remains that these graduates are the unit-level source of instrument expertise. They can make a difference in wing instrument training programs — ESPECIALLY THROUGH AIRC INVOLVEMENT. SIFC has finally been authorized to award its graduates a Special Experience Identifier (SEI), Code EV and has notified unit CBPOs to document this in the personnel records. Now, SIFC graduates can be readily identified and their expertise more effectively utilized.



• **Final thoughts . . .** As soon as SIFC has the first copy of the new USAF Instrument Exam, we'll begin work on revising the SAC Supplemental Exam. After coordination with CEVG, the new SAC test will be forwarded to HQ SAC for final approval and publication. SIFC is also updating the IG 60100 program, and will forward the revised version to the 4235 STS for reproduction and distribution. For the second year in a row, SIFC is honored to be SAC's nominee for the USAF Duckworth Instrument Award. We're keeping our fingers crossed. Next month, a more conventional article will fill this space. Until then, if you have questions, call us at AV 347-4571, and cross-check those gauges.

Capt Robert J. Goodman
42 AREFS, Loring AFB



Not Your Ty

We were scheduled for a 0330 takeoff from Pease AFB on a routine transatlantic fighter drag. As a tanker in exercise CRESTED CAP I, we were to provide fuel, navigation and communications for a flight of 24 F-4E aircraft headed from Seymour Johnson AFB to Europe. The plan called for four cells of two tankers each: one KC-135 and one KC-10 in each cell. The mission commander would be in the KC-10 in our cell.

The mission went without a hitch up until the fourth air refueling, about three hours into the flight. One of the F-4s in our flight had just finished his refueling and was on the wing of the KC-10 when he reported an afterburner nozzle failure. This was significant because the KC-10 had been forced to use toboggan procedures and the receivers had to use afterburners occasionally just to stay on the boom. A quick visual check by his wingman revealed that there was an oil leak coming from the underside of the aircraft; the loss of the engine appeared certain. It was daylight now and I could see the F-4 and his wingman trailing the formation.

At this point a decision was made to divert the two F-4s to the nearest abort base, Gander, Newfoundland — nearly 500 miles away. Under normal circumstances the F-4 should not have had a problem flying this distance, but he couldn't hold his altitude and had already dropped below the assigned block altitude, flight level 240 to 270. Five minutes later when the F-4 encountered problems with his good engine, the mission commander directed us to turn toward Gander and catch the ailing F-4.

As we made the turn toward Gander, we descended to FL 240 to avoid altitude conflict with the following cells. Capt Michael F. Clover, the copilot, de-

ical Air Refueling

clared an emergency with Gander Center and made requests for lower altitudes as they were needed. The navigator, Lt Karol R. Wojcikowski, set a course to intercept the fighters. Air-to-air TACAN and UHF direction finding were the only means of rendezvous.

In order to close the gap between us in the minimum amount of time, I started a shallow descent and increased my airspeed to 350 knots (maximum allowable). As a guide for my descent, I used the F-4's altitude plus 1000 feet. As we passed 18,000 feet, we obtained the Gander altimeter setting and used that for the remainder of the flight. The mission commander was kept abreast of the situation by relay through trailing cells.

The weather had been clear at our original altitude, but as we descended we passed through layered decks of clouds. Even at our lowest altitude, there were clouds between the ocean and us. Gander Center scrambled Search and Rescue forces at our direction, just in case the F-4 crew had to bail out. The water temperature was 32° F which would have allowed the crewmembers only a few minutes of life if they had been unable to get into their rafts.

By this time the engine that was losing oil had seized, resulting in tremendous drag. To lessen this drag Maj Alexander, the F-4 pilot, salvoed his centerline and wing tanks. I suggested to him that I might be able to tow him. Before the rendezvous was complete, a hydraulic spoiler malfunction made it so that the fighter could not make right turns.

After a 30-minute chase, we completed the rendezvous, still far out of range of ground-based navigational aids. We approached the F-4 from the right, making a left "S" turn to pull in front of him. To decrease his rate of descent, Maj Alexander had slowed to 190 knots, so I had to watch the angle of attack closely to make sure we had an adequate margin above stall. I used .6 AOA as my minimum.

By now all three aircraft were passing 7500 feet and still descending. Maj Alexander told us that the remaining engine was not putting out enough thrust to overcome the drag on the aircraft; consequently, he could not close on us for air refueling. I increased the descent rate and reduced the power, in essence, "backing" toward the F-4. SSgt Douglas D. Simmons, the boom operator, directed the closure from the boom pod in reverse "GCA" fashion. We would have to attempt this hookup at 125 knots slower than the normal 315 knots. To help the F-4 close to precontact, I lowered flaps to 30° and slowed to approach speed. As the F-4 moved into position, I accelerated to match his airspeed and retracted the flaps. Under the guidance of SSgt Simmons, I slowly "backed" the tanker up to the receiver using very small power reductions.

"Too much or too rapid of a pitch change would sling the F-4 off the boom like cracking the whip."

The refueling system was set up for tanker manual operation so that the boom would not disconnect when a limit was reached. The boom was very difficult to control at the reduced airspeed. The refueling was further complicated by the nose-high attitude of both airplanes and the F-4's side slip with only one engine running.

At about 4000 feet we made the first hookup with the tanker's throttles in idle and a 1000 fpm rate of descent. I very gently leveled off and eased in the power. This was the most critical maneuver since both aircraft were already operating near the limits of their capability. Too much thrust would result in a disconnect. Too much or too rapid of a pitch change would sling the F-4 off the boom like cracking the whip. We would attempt to tow the receiver at best endurance speed to provide the greatest lift for the least drag. Too fast or slow would place needless stress on the boom connection and we had to avoid maneuvering until the boom had been eased against the stops.

We slowly started a 500 fpm climb to gain altitude. The feel of the airplane while towing was much the same as a car; we could feel the strain on the plane. We towed the disabled plane for a few minutes while Capt Clover pumped 2700 pounds of fuel. I told the pilot that this reminded me of when I towed gliders. He said, "Well, my back seater says we're not much more than a glider now."

At approximately 4500 feet, a brute force disconnect occurred despite the effort by both pilots and the boom operator to be as smooth as possible. I immediately pulled the throttles to idle and started a 1000 fpm descent to again give the F-4 the advantage. At 2000 feet MSL we finally made the second hook-up. We bottomed out our gentle descent at 1800 feet MSL before I could add power and begin climbing. This time I climbed at only 300 fpm, hoping that the shallower climb would let us tow the F-4 without another disconnect.

The idea worked until 6000 feet before another brute force disconnect occurred. Repeating the delicate closure process, we were connected again at about 3500 feet. Unfortunately, our third brute force disconnect happened at about 5000 feet. Throughout the series of tows, our airspeed had stayed between 190 and 210 knots. However, after the third brute force disconnect, luck was with us. The thrust to drag ratio of the fighter improved, and he made a climb under his own power to 9500 feet and accelerated to 250 knots. With the tension eased, Maj Alexander commented that 250 knots never looked so good. I looked over and saw him passing us so I told him that I would reverse the normal procedures and fly as his wing man because of his limited power and controllability.

The course that Lt Wojcikowski had set allowed for a left turn to final at Gander International Airport since the F-4 was unable to make right turns. We stayed in a holding pattern on the final approach course until both of the fighters had landed safely, then we landed five and one-half hours after takeoff.

There was no doubt in my mind that an F-4 and its crew were kept out of the "drink" that day — probably saving both lives. We could not have saved them without all the crewmembers in both aircraft coordinating flawlessly to get the job done.

***Editor's note.* For their superior accomplishment, Capt Goodman and his crew were nominated by Strategic Air Command for the Koren Kolligian, Jr. Trophy.**

THE CUTTING EDGE

DO YOU MEASURE UP?

1Lt Evan J. Hoapili
Ellsworth AFB

"Air Force instruction must equip people to do their jobs". This statement from AFM 50-2 seems obvious, doesn't it, but don't let its simplicity fool you. The principle this AF manual refers to is a significant one and carries with it great responsibility for those people who develop, implement and manage training programs. The statement takes on even greater importance when it is linked with the training programs teaching missile combat crews to do their critical job of controlling nuclear resources and accomplishing the EWO mission vital to our national security. Additionally, the effect of training on crew performance is second only to individual ability and motivation. We must maintain a high quality of training to insure crew performance remains sharp.

An instructor has many means at his disposal to help crewmembers. The most comprehensive of these is the missile procedures trainer (MPT). The MPT is a place where a crew can combine all the other types of training tools (study packages, classroom lectures, etc) into an environment giving immediate feedback and simulating actual situations. MPT training consists of many phases: pre-MPT briefing (what is expected to the crew), the MPT session itself, post-MPT critique (relating your observations to improve future performance) and MPT documentation (for use in analyzing future training requirements).

The focus of MPT instruction shouldn't only be on errors made, but also on the causes of those errors. In other words, what contributed to the crew having a less-than-desired performance? Most of us would agree a program aimed at only treating errors is not very efficient. We can see the merits of identifying cause or contributing factors and subsequently treating these along with the errors. It is also reasonable to assume there is a set of "foundation skills" used by any missile combat crew and a deficiency in one or more of these could be the contributing factor we are looking for. What I hope to do is identify a set of foundation skills and relate them into a visually oriented process you can use to enhance a training program.

cont'd on page 26

Capt Larry Spivey

(The narrative of this article was based on a personal experience by Capt Randy Allen, a CCTS instructor at Castle AFB.)

The other day I heard a "war story" that is good for more than retelling over a few beers. There is also a valuable lesson which winds its way throughout the tale. It involves an unprecedented emergency which could have easily resulted in disaster. First the story, then the lesson.

IFE and Crew Coordination

A B-52 in support of Global Shield launched enroute to its mission. Shortly after passing 14,000 feet, the aircraft experienced nearly total DC power failure. As defined in the dash one, there was total loss of forward and aft TR power. The result was loss of all navigational equipment, both UHF radios, internal lighting, heating, fuel pumps, flaps, and other essential flight controls. What was left were the magnetic compass, battery power, and surprisingly, the HF radio, which was mistakenly wired directly to the battery.

After the initial reaction to "fly the aircraft," the crew began to investigate the exact nature and extent of the damage. Dash ones were immediately put to use and an intensive crew discussion initiated. This interaction quickly identified the essential problems. The total "nuts and bolts" picture soon began to emerge. Significant facts were extracted from the dash one dialogue. Critical factors included lack of anti-icing, inability to transfer fuel, lack of navigational equipment, and loss of heating.

One predominant factor contributed to a multitude of problems — the aircraft could not descend due to an undercast cloud layer. Without navigational aids or radio contact with air traffic control, VFR on top was the only option available. This meant staying at an altitude with a temperature well below freezing. Thus anti-icing, lack of heating and fuel feed problems compounded one another. As the temperature inside began to drop towards the ambient temperature, the crew was forced to don parkas, thermal underwear, mukluks, and heavy glvoes. The dash one states that at altitudes in excess of 14,000 feet, engine driven fuel pumps tend to cavitate without boost pump pressure, causing some or all engines to flame out.

Meanwhile, tenuous radio contact via the HF radio had been established with another bomber, the intended cell mate. Due to extreme noise, however, it was decided to move to another frequency. At this point, the second B-52's HF radio became inoperative and once again the crew was isolated. Finally, an HF phone patch was established with the home command post and a conference set up with Boeing experts in Wichita and the air traffic control center in Indianapolis.

During this period of isolation the crew continued to evaluate the situation and determine options. A survival radio was removed from a seat kit and with the antenna extended out the sextant port, contact was attempted but to no avail. The pilot and navigator continued in the attempt to fly "the **black line**" by dead reckoning and the magnetic compass. The undercast was virtually solid allowing only brief glimpses of the nighttime landscape. The copilot continued to calculate available flight time remaining and center of gravity (CG) limitations. It soon became apparent that aircraft CG was the critical factor and the crew either had to find a suitable airfield for landing or abandon the aircraft.

Finally, through identification turns relayed by the command post via HF, ATC was able to establish radar contact. The second B-52 was then vectored for a join up in order to lead the disabled aircraft to a suitable landing base. The question now: Will the aircraft remain flyable long enough to reach its destination?

The copilot continued to calculate the CG limits and keep the crew informed; it would be close. Boeing officials concurred and could only make best guess estimates as to the outcome. They expressed doubts about the aircraft landing flaps up at the predicted gross weight, which was in excess of 380,000 pounds.

The boost pump loss continued to cause problems. All turns and descents had to be accomplished very gradually. Finally, during descent for landing, two engines flamed out and would not restart. The aircraft now could not maintain altitude and an involuntary gradual descent began. The pilot advised the crew of the situation and that under present conditions they still had sufficient altitude to make the landing. The CG continued to shift aft and the margin for error had decreased to virtually zero.

The aircraft was now committed to a heavy weight, flaps-up, six-engine approach and "landing." A go-around would not be possible due to the aircraft CG. It would be a one time shot. A final discussion ensued to confirm that the crew was unanimous in its decision to land the airplane. This decision accomplished, the bomber began its final approach.

Fortunately, the skills of the crew were up to the task and a successful landing was accomplished. Firecrews were in readiness and foamed the wheels after the aircraft had stopped to prevent the excessive heat in the brakes from further damaging the aircraft.

This in-flight emergency (IFE) serves as an excellent springboard to discuss crew coordination during emergencies. Just as with many aspects of flying, we build our foundation for good coordination on the ground. According to the tech orders, a "complete familiarity with (our) crew position, the responsibilities there of and a working knowledge of other crew members' duties will contribute immeasurably toward crew coordina-

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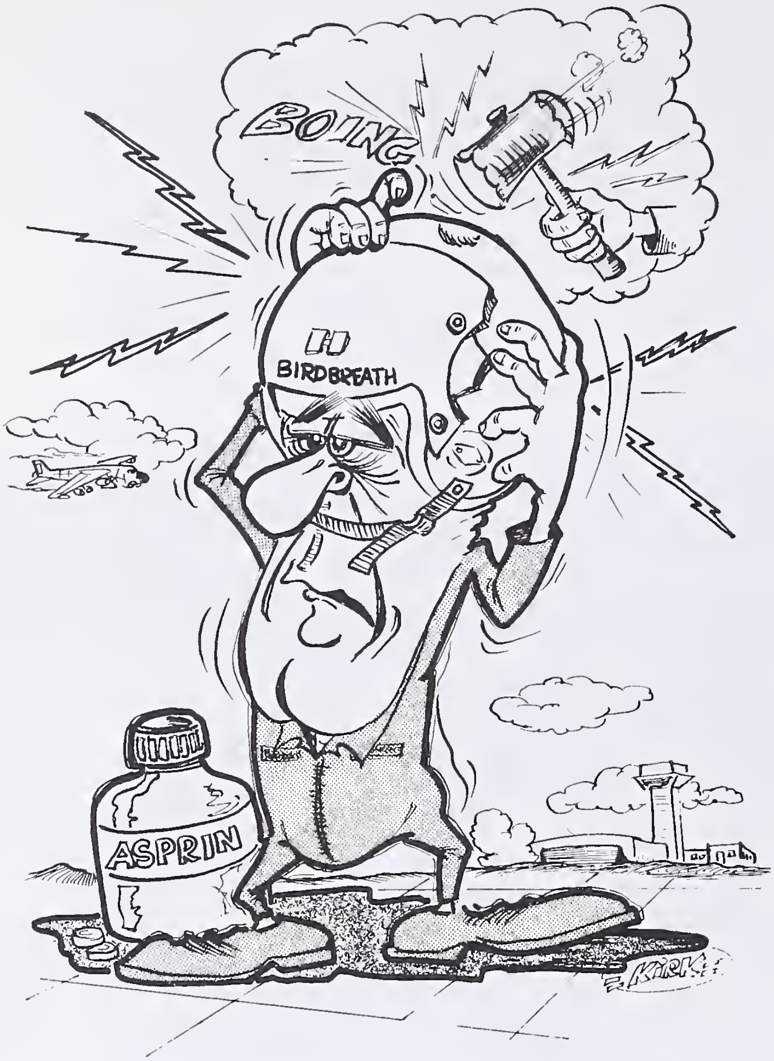


Helmet Headache?

Capt Joe Burns
96 BMW, Dyess AFB

The reason for the question mark is this: Helmet headache is probably not caused by the helmet at all.

After many hours of flying the B-52 I was convinced that my helmet was the cause of my frequent headaches. In what follows I'll explain how I discovered the real culprit (**dehydration**) and how this discovery brought me much needed relief.

My first headache was on CCTS flight number one at Carswell AFB in July, 1975. It established a pattern that never changed during the next 1500 hours. Somewhere around the six or seven hour point of each flight mild pain would creep across my forehead. By eight or nine hours I could no longer ignore it and on any flight approaching ten hours the pain became intense. Often it seemed as if my forehead had turned to mush and was very sensitive to the slightest touch.

For years I had assumed I should simply "grin and bear it" and chalked it up as an occupational hazard of helmet wearing. Then in 1981, two events occurred which combined to bring me relief.

The first event happened during an aviation physiology (the three year refresher course). Somewhere during the afternoon session the instructor asked a question which stirred me to life. "How many of you get headaches on long flights?" After a show of most hands he asked simply, "Do you know why?" Someone answered quickly that it was caused by the helmet, and since I'd already flown an eight hour commercial flight without a headache, I agreed. A brief debate followed as the instructor tried to pin the entire blame on dehydration, but several of us remained unconvinced. Unconvinced, that is, until I flew my first "special." This was the second event that occurred which finally opened my eyes.

For those of you who may never have had the opportunity to fly a "special," it is essentially a desperate attempt by nine crewmembers not to have a bowel movement on a 30-hour flight.

At the rate my headaches progressed I would be a drooling idiot after 30 hours. I was confident, however, that I had a solution. I would use my helmet only when absolutely necessary and otherwise would remain on headset.

It worked well for the first seven hours and then the pain began again. As we passed the 12 hour point lethargy set in and I could hardly imagine how to endure the next 18 hours. My mind wandered back to the debate in physiology class and I had to try the dehydration theory. I climbed down to the lower deck and drank two full cups of orange drink to increase my body fluid.

The improvement was dramatic. Within minutes the lethargy subsided and I felt somewhat refreshed. In ten minutes the headache was entirely gone. The remaining 18 hours were pain-free. I had found a cure for helmet headache.

Perhaps you already knew both the real cause and solution for helmit headache. If so, you may keep an eye out for fellow crewmembers who have yet to learn the secret. Any complaint of headache or obvious lethargy could be a sign of low body fluids.

In this time of long duration flights, crew fatigue plays an increasingly important role in mission success. Simply by applying information we've already been given, we can eliminate one of the factors which contributes to this crew fatigue — **helmet headache.**

EDITOR'S NOTE — The following article is from the USAF Safety Journal and is directed to USAF aircrews.

SAFETY— "You Gotta Believe It!"

Capt. Stanley A. Moorhouse • USAF

How many times have we crewmembers heard a mission commander stand up, face the crowd, and say those incredible words: "SAFETY IS PARAMOUNT." If you are a military flyer with a few years of flying under your belt, my guess is that this meaningless, trite, misguided jingle has irritated you more than practically any other phrase, except perhaps: "You are the only one left to fly this weekend." Both statements arouse suspicion among us. And, in military aviation, the former is never true. Let's admit it — safety is not paramount. It never was. Producing X units of safety is not the proper role of military aviation, even if we could devise such a system. Think back and recall the oath you took. What did it say about safety? Nothing. It was more concerned with a specific and clearly stated objective — to protect and defend the Constitution of the United States. Don't get me wrong. I am not knocking safety. As a matter of fact, I am a flying safety officer. That means that safety is my speciality. Safety, though, is part of everybody's job, all the way from the most senior flying commander to the youngest, most recently certified crewmember.

Mission accomplishment is the ultimate goal for military operations and safety is the tool, the grease, which makes mission success a possibility. Most flyers understand this. That is why crewmembers grumble with disgust when a safety officer or a mission commander with confused priorities repeats that inadequate phrase: "Safety is paramount." It makes no more sense to say that safety is production, or services performed, or crops harvested. Regardless of the goal, safety must be incorporated to ensure a proper mix of accomplishment and resource retention. Let's face it, mission accomplishment is the name of the game, and we safety types had better preach it that way or risk our credibility, or maybe diminish the combat capability of the Air Force.

Don't say safety is paramount to a crewmember about to take off on a low level mission at night, in mountainous terrain, in marginal weather; in formation in order to make a strafing pass; or about to drop a bomb, release heavy equipment, make a low altitude parachute extraction, land on a tiny, poorly lit dirt strip, or launch on a real-life rescue mission. We Air Force types routinely do these high-risk missions, and we do them quite well. And, we could not do these missions believing that safety takes precedence. The risk and danger involved in these sorties is clear evidence that mission accomplishment, not safety, comes first.

Safety makes sense only when used as a tool of mission accomplishment in an era of limited resources. The Air Force's objectives are poorly served by those who insist that the peacetime mission must be accomplished at all costs. Those who would rush headlong, headstrong, and poorly prepared to accomplish an equally poorly planned mission can, and sometimes have, paid the price in terms of damaged or destroyed aircraft and injury or loss of life. Such people fail to understand mission accomplishment. An on-time takeoff, a point-of-impact drop score, or an aggressive completed formation rejoin off the range do not constitute an accomplished mission. The job is only partially completed at that point. Mission accomplishment occurs only after the chocks are in place, the forms are signed, and the flyers are in the bar sipping a cool one. Safety is not paramount. SAFETY IS MISSION ACCOMPLISHMENT.

PROFESSIONAL PERFORMERS

Missile Crew

Crew R-191, consisting of 1Lt Kevin J. Jacobsen, MCCC; 1Lt Woodman H. Page, DMCCC; A1C Michael J. Brown, MSAT; and Sgt Barry G. Pulley, MFT, 390 SMW, Davis-Monthan AFB, is SAC's Missile Crew of the Month.

The members of crew R-191 were under observation by a SAC IG evaluator when they received indications of fuel vapors in the missile launcher. The crew immediately performed proper hazard checklists and correctly determined the vapor sensing equipment had malfunctioned. Following a power transfer to the standby diesel generator, the crewmembers discovered a diesel fuel pump leaking. The crew immediately switched to the backup pump and isolated the leaking pump thereby preventing a serious diesel leak and a potential fire hazard.

During the weapon system test phase of the inspection, the crew performed a launch verification check to determine sortie effectiveness. A launch hold was encountered on the first attempt. The crew explicitly followed troubleshooting procedures and the launch verification was successful on the second attempt. Lt Jacobsen and Sgt Pulley then proceeded to the missile launcher equipment area to manually open a launch critical water valve. As the valve was being opened, a retaining pin sheared and the valve handle fell off. Lt Jacobsen and Sgt Pulley carefully dismantled the gear mechanism, fashioned a new shear pin because the spare replacement would not fit and were finally able to open the valve. Their innovative actions were completed within critical time constraints and their missile sortie was rated "effective" by the SAC IG evaluator. The performance of this crew directly contributed to the "outstanding" rating for mission effectiveness achieved by the wing during the SAC ORI.

Missile Maintenance

A1C Alex S. Welton, 351 SMW, Whiteman AFB, is SAC's ICBM Maintenance Airman of the Month. A missile electrical team member, A1C Welton is responsible for the accurate fault analysis, checkout, repair, replacement and servicing of electronic support equipment for 165 remote Minuteman missile facilities. He is an outstanding technician; he maintains task qualification on the hazardous and seldom performed removal and replacement of the 2100 pound motor generator and the highly complex motor generator alignment procedures. A1C Welton's record of performance under local and higher headquarters evaluations has also been superior. His perfect scores on communications security and Minuteman code handling procedures assured an "Excellent" rating during the last IG visit. His successful evaluation during the 3901 SMES visit directly contributed to the "Outstanding" rating that was received by his branch and wing.

NEXT?

Capt Arv Taylor
96 BMW, Dyess AFB

Well, we've done it again. We've proved that takeoffs, landings and low level are critical phases of flight. How? By destroying three B-52s, one FB-111 and killing 16 crewmembers in the past two years. This is a tragic price to pay to prove something which should be obvious to anyone who draws flight pay.

While SAC is making excellent progress at reducing the overall mishap rate (.58 per 100,000 flight hours in 1982 and .61 in 1983), we continue to lose airplanes in exactly the manner most of us would predict, during takeoffs, landings, and low level operations. Why?

Are there conditions unique to takeoffs, landings and low level operations which make them particularly hazardous? Of course there are. These phases of flight are the most demanding upon the aircraft and crew. Reaction time is minimum in these regimes and sufficient time may not be available to safely recover the aircraft.

The loss of engines at liftoff, while at a heavy gross weight, really makes B-52 or KC-135 pilots earn their flight pay. You have your hands full just flying the airplane, which is exactly where all of your attention should be. Any distraction could be fatal and must be eliminated. Radios, interphone, checklist, everything else becomes extraneous. All you are concerned about is getting the aircraft into, and maintaining, a safe flight envelope. Surprises are not welcome.

Flying terrain avoidance at the STRC in the middle of the night when you can barely keep your eyes open does not provide good training. It is dangerous! You will impact a mountain three miles in front of you in less than one minute if you don't take corrective action. When you are tired, it could take that long just to recognize the hazard.

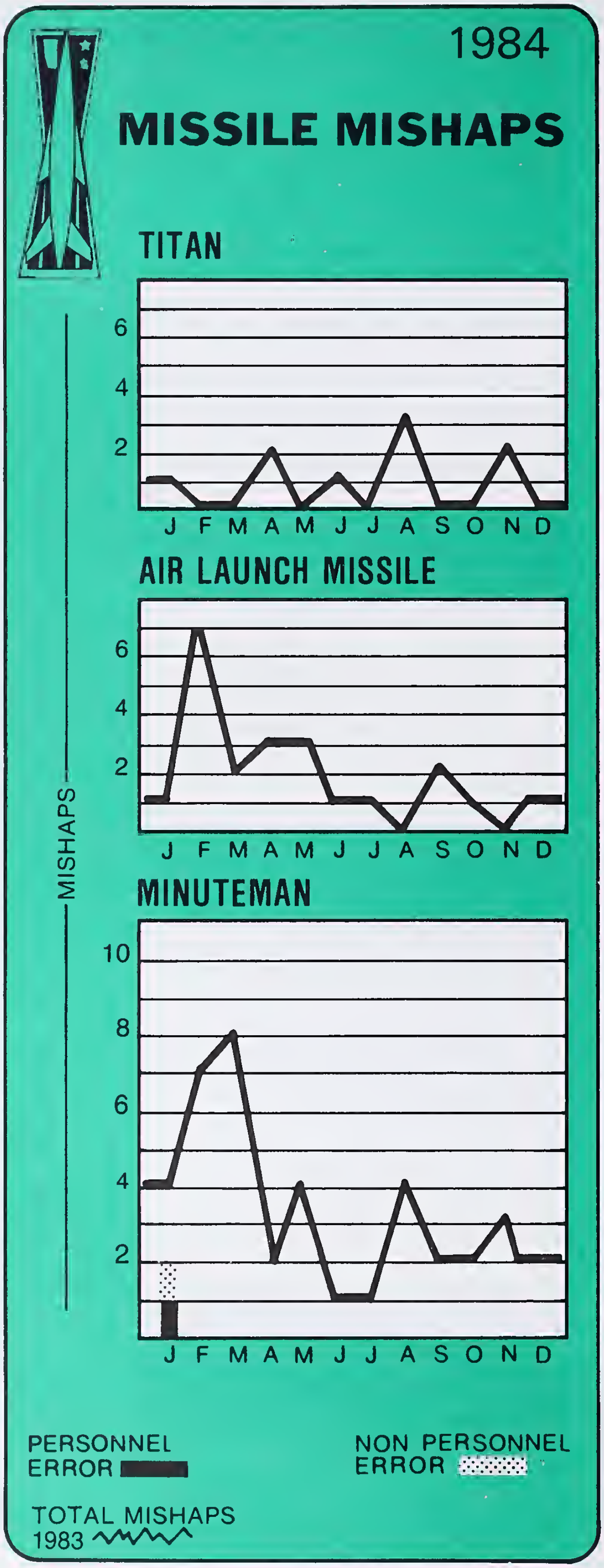
How many crews have relaxed once they arrive at home plate for an hour of transition? Paperwork needs to be completed, the EW finishes the 781, and the Nav finishes his flight lunch. In a couple of hours you will be on the ground reviewing the mission over a cold beer. Descending at 700 fpm you are less than 18 seconds from impact at decision height. Not much time to react to a major malfunction and absolutely no time to refocus the crew's attention to flying the approach.

These examples illustrate what can happen if the aircrew is not mentally alert and consciously prepared to handle the most adverse conditions during critical phases of flight. The recent mishap at Castle documents how being alert and prepared can save the crew, if not the aircraft. Less than two minutes after the crew evacuated the aircraft it was consumed in a fireball. This would have been a tragedy if the IP had not been ready to handle the problem immediately.

So how do we prevent aircraft mishaps during takeoffs, landings and low level operations? The decreasing mishap rate substantiates the improved reliability of the machines we fly. Improved maintenance procedures have helped reduce mechanical failures markedly. I seriously doubt, however, that we will ever be able to design and produce aircraft and parts which will not fail. Therefore, the ultimate, and the most difficult factor in reduction of the mishap rate rests with the men and women who fly the aircraft. We must be prepared to solve the most difficult problems before we are out of altitude, airspeed or both.

Takeoffs, landings and low level; each has critical elements which can destroy you and your aircraft, but each of these elements has a remedy. A time proven approach can help; "table fly" the critical elements during mission planning. Don't get involved with the nit-noy's, however. Break the mission down into specific phases, i.e., takeoff, initial climb, cruise, air refueling, low level, transition, and discuss actions to be taken in an emergency situation. Insure that everyone knows that maintaining aircraft control and position orientation, vertically as well as horizontally, are the important requirements. This simple mental rehearsal will make you better prepared to handle the unexpected.

Prepare for the worst. If you do, everything else should be a piece of cake. Being prepared increases your margin of safety, particularly during the critical phases of flight. Being prepared increases your ability to survive. Crash proof aircraft have not been designed. The best we can do is to know the hazards and be prepared to deal with them. All too often it takes a major aircraft accident to bring the problem to our attention. *Be ready for the unexpected because the crewmembers are the last and most crucial link in preventing aircraft mishaps.*



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tion." This factor, of course, is applicable to all phases of flight, not just emergencies. To improve our crew coordination during an emergency, we should add to this foundation an understanding of aircraft systems and emergency procedures. Improving this foundation, we need to become familiar with the way sections of the tech orders are laid out, where to find detailed information on the different aircraft systems, location and use of emergency equipment, and how to find the location of circuit breakers, fuses, and various pieces of equipment.

During an in-flight emergency is not the time to be fumbling around trying to locate a circuit breaker or fuse. Next, develop a crew plan of attack. It will be almost impossible to plan for each emergency, but you can decide who is going to fight the "fire," read the tech order, pull circuit breakers, or handle the communications. This study and plan of action will serve as an excellent foundation for crew coordination.

Of course, the number one priority during emergencies is "maintain aircraft control." This action may be relatively simple or occupy the total concentration of both pilots. Therefore, we as non-pilot crewmembers must be ready to assist the pilots in any way possible. Here, good crew coordination will pay off. In order to determine the problem and select the proper course of action, the pilots must have as much information relative to the emergency, as possible. As stated in the story, ". . . after the initial reaction of 'fly the aircraft,' the crew began to investigate . . . and an intensive crew discussion was initiated."

Armed with the foundation we discussed earlier, the crew can more rapidly determine the problem and give the pilot more pertinent information so that he/she can select the proper course of action. While the pilots are busy flying the aircraft, the other crewmembers should research the problem and relay this information to the pilot. One point should be emphasized: if you are reading from section three for the pilots, take special note of the highlighted sentence on page 3-1; "when accomplishing emergency steps, coordinated actions by crewmembers are essential to insure each step is correctly accomplished in the proper sequence." After the problem has been identified, it can usually be quickly corrected; however, in this case, it could not. Now the crew must work around the results. Good crew coordination can now really shine. While some of the crew members continue to perform their primary duties — fly the black line, calculate available flight time and CG limits, or maintain radio contact — the others can try to compensate for the loss of equipment. This crew, faced with a multitude of equipment losses, rapidly pooled their knowledge to find corrective actions. With all crewmembers trying to solve the problem, many unique ideas can be generated and many duties can be assumed in order to relieve the burden of the pilots. Using the survival radio in an attempt to contact ATC, handling communications while the pilots handle the aircraft, using the sextant to determine structural damage or using the FCS to determine airspeed are just a few examples of crew ideas.

Crew coordination is absolutely critical in emergencies and is the most frequently addressed item in aircraft incidents. In this case, the presence of good crew coordination enabled the crew to pool their collective knowledge and talents to select the course of action leading to the successful termination of the IFE. In summary, let's list some of the "do's" to improve crew coordination:

- Know your job, especially how your duties influence others.
- Gain an understanding of other crew duties — you may be able to relieve some of their burden.
- Study the various aircraft systems — have a good working knowledge of how they work and how the loss of that equipment will effect you and the aircraft.
- Review the tech orders, understand their layout so that you can quickly locate the required information.
- Know the location of emergency equipment and how it operates.
- Review the location of circuit breakers, fuses, and equipment you may need access to during an IFE.
- Form a crew plan of attack for IFEs — who's going to do what and when.
- Read or discuss with others their past IFE experiences — especially what they did or should have done to help.
- During the IFE remember that "maintain aircraft control" is the number one priority — don't interfere with its accomplishment.
- Provide assistance to the pilots — the final determination of the proper course of action rests with them.

These are just a few ideas to improve crew coordination. Good crew coordination frees the pilot to fly the aircraft, focuses more knowledge and talents on the problem and allows more corrective actions to be accomplished in a shorter period of time.

For these reasons and more, good crew coordination can not only save the aircraft but also your life. It's well worth your efforts to improve it.

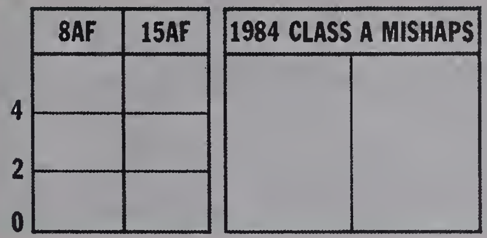
Fly The Aircraft!

SAC'S FLYING SAFETY RECORD

CLASS A FLIGHT MISHAPS

YEAR	74	75	76	77	78	79	80	81	82	83	84
TOTAL MISHAPS	8	4	4	4	1	5	4	4	2	2	0
FLYING HOURS 100,000	5.1	4.2	3.9	3.7	3.6	3.6	3.4	3.5	3.5	3.0	0.3
FATALITIES	14	7	22	10	5	7	2	14	9	7	0
RATE	1.6	1.0	1.0	1.1	.28	1.4	1.2	1.2	.58	.65	0.0*

*ESTIMATED RATE BASED ON 310,000 FLYING HOURS



CLASS B	
JAN	0
1984	0

CLASS C	
JAN	1.3
1984	1.3

FLYING HOURS	
JAN	26,309
1984	26,309

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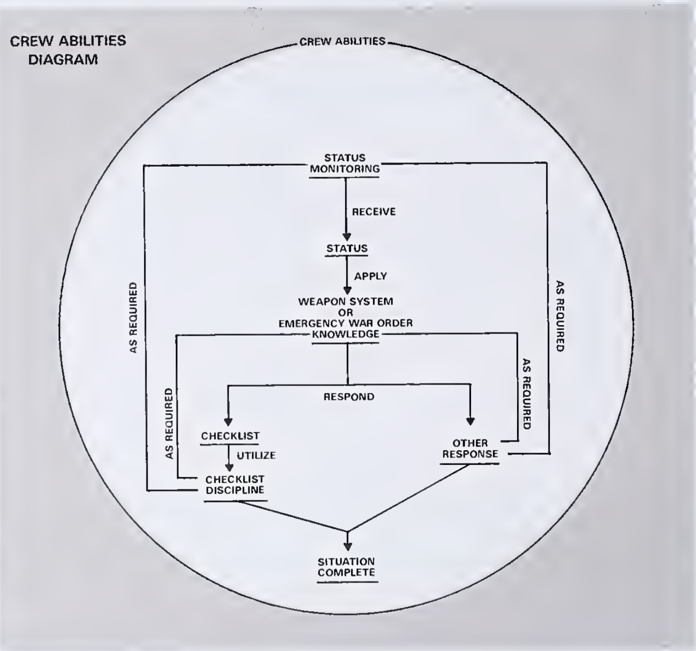
Although there are many skills you could identify as foundation skills, I have selected five I consider essential to crew success. These are: Status monitoring, weapon system (W/S) knowledge, emergency war order (EWO) knowledge, checklist discipline and crew abilities. These are probably very similar to areas you currently rate in your post-MPT critique and MPT documentation. If so, you are already over halfway to an effective training program.

Just in case there are any questions on my definition of these skills, I will give a brief explanation of each. **Status monitoring** refers to a crew's ability to receive status (prints, audible/visual indications) and to control, i.e., not lose track of, status. **W/S knowledge** implies an understanding of launch control center (LCC) and launch facility (LF) operations, indications and responses. A crewmember must use W/S knowledge to understand checklist actions and make appropriate responses to received status. **EWO knowledge** is similar to **W/S knowledge.** In both you must understand checklist actions and make appropriate responses. Additionally, **EWO knowledge** contains an understanding of making various communication and weapon system assignments or reassignments (this is usually the task of a squadron command post). Fully completing a checklist and properly utilizing every step, note, caution, warning, lead-in and amplification falls under checklist discipline. Finally, crew abilities are priority setting, crew communication and coordination, procedures for handling situations and the control and direction provided by the crew commander (MCCC). Now that we have identified the skills, we can show how a crew moves from the beginning of a situation to its conclusion.

The **crew abilities** diagram shows how these crew skills interrelate. This diagram is very easy to use. It begin with **status monitoring** which is a continuous crew activity. Once a crew receives status (remember status can be prints, lights, alarms, briefings, time, etc.) they apply their **W/S** or **EWO knowledge** as appropriate. Here lies a decision point for a crew; their response to status. Crews will normally respond with a specific checklist or procedure. In some cases there might be some other response. These types of actions may be memory items, references that are not checklists or no response at all. If the crew responds with a checklist, they must utilize their **checklist discipline.** While processing a checklist or other response, you may be required to accomplish further **status monitoring** or **W/S-EWO knowledge** skills. Thus we have the double arrows that may have a crew loop through all or part of the diagram. Finally, there will come a point where the situation will be complete. The **crew abilities** skill impacts on all the other skills equally when handling a situation. Now we have our foundation skills and a system relating these skills. Next let's see how we use this information and what benefits we derive from its use.


CREW ABILITIES DIAGRAM

At my wing (44 SMW) we list contributing factors on our MPT documentation form. When a crew makes an error we describe the error and link a cause to it. We also have a version of the **crew abilities** diagram in our Instructor Handbook. We use this system in many ways. First, we use the diagram to train instructors on the use of our MPT documentation form by giving them an idea of how the skills interrelate. It is also used to train instructors on how to observe a trainer ride and conduct a meaningful critique of the MPT session. We have found this approach gives our ratings more consistency and objectivity. This system is also well suited for student critiquing. By using the diagram and the details of a situation, you can very easily, and visually, show a crew not only their error, but also what could have prevented it. We even use the diagram to handle "what if" questions. This system of skills does not imply one skill is more important than another. For example, if you are critiquing a student's poor performance in the MPT and have determined his major problem is **W/S knowledge,** you can use the diagram to show him he is basically losing the arrows going from the W/S knowledge block. This implies that weak knowledge may lead to incorrect responses (not getting to the checklist at all) or not understanding a checklist once he gets to it. A weakness in crew abilities would be like losing all the arrows in the diagram before a training session to explain what is expected of the crew and to show them the process they should use to handle problems. In fact, we have even used this system to help a crew member who was displaying the symptoms of test anxiety. It helped him put the events of a training session into a more meaningful perspective. Finally, we can conduct a deficiency analysis of these contributing factors from our completed MPT documentation form to use in determining our future training objectives and emphasis.

I feel this system is very beneficial to our training program and a great commitment to the crew force to do the best job possible. *How does your own training program compare to the principle of equipping people to do their job?*

Safety Screen

The SAC Safety Screen is an honor roll of SAC's most professional crews. To gain listing on the Screen, crew members must be nominated by their unit commanders and meet high selection criteria of experience in their aircraft or missile system *IAW AFR 127-2/SS1*.

381 SMW, McConnell Crew R-053: MCCC Capt Evelyn Aponte, DMCCC 2Lt Rodney K Von Wagenen, MSAT A1C Michael J Sweeten, MFT A1C Gregory B Johanson

351 SMW, Whiteman Crew E-062: MCCC Capt Larry P Daniels, DMCCC 2Lt Terry L Johns

390 SMW, Davis-Monthan Crew S-224: MCCC Capt Mark O Strother, DMCCC 1Lt Jerry Renne, MSAT Sgt Wayne R Frey, MFT SSgt John C Gullock

90 SMW, F E Warren Crew R-137: MCCC 1Lt Mike Farrell, DMCCC 2Lt John P Cornett III

91 SMW, Minot Crew E-024: MCCC 1Lt Bradley B Dunning, DMCCC 2Lt David A Baumann

341 SMW, Malmstrom Crew R-127: MCCC Lt David J Flanagan, DMCCC 2Lt James P Contad

44 SMW, Ellsworth Crew S-227: MCCC 1Lt Mark E Secan, DMCCC 2Lt Bernard C Devaney Jr

320 BMW, Mather Crew R-114: AC Capt William Saunders, CP 1Lt Gregory Wiebe, NN 2Lt Robert Roukema, BO SSgt Alva Medbery

328 BMS, Castle IT-16: IP Maj Robert A Borkowski, IRN Lt Col Harold W Hodges, IEWO Capt Charlie Childress Jr, IG SSgt Robert C Phillips

2 ACCS, Offutt Crew S-103: IP Maj John T Tresmer, CP 1Lt Rande A Ricketts, IN Capt Eric L Kilijanski, IBO SSgt Bernd D Ekdahl

337 BMS, Dyess Crew E-31: P Maj Charles M Core, CP 1Lt David P Russell, CP 1Lt Terry L Wescoat, RN Maj Michael B Manning, N 1Lt Dennis J Jacobs, EW 1Lt Curtis L Harris, G SSgt Donald L Holmes

337 BMS, Dyess Crew E-34: P Capt Joe L Culpepper, CP Capt Edward T Dixon, RN Capt Herbert P McClain, N 2Lt Charles S Roberson, EW 1Lt Oliver E Schmoker, G SSgt John P Burkhart

320 BMW, Mather Crew E-13: AC Capt Garrison H Fleming, CP 1Lt David A Hutchinson, RN Capt John D Orr Jr, NN 1Lt Brian P Young, EW 1Lt Matthew J Hickey, AG SrA James R Hungate

46 BMS, Grand Forks Crew E-31: P Capt Frederick O Schott, CP 1Lt Michael E Walker, RN Capt Jeffrey A Zink, N 2Lt Steven E McKay, EW 1Lt Matt W Oswald, G Sgt John J Penella Jr

917 AREFS, Dyess Crew E-110: IP Maj Michael Wellington, CP 1Lt Wayne Bradshaw, N 1Lt Phillip Neely, BO SSgt Charles Pierce

93 AREFS, Castle IT-56: IP Capt David C Patton, IN Capt Joel J Petkovich, IB TSgt Thomas M Cylce

FLARE

UNIVERSITY OF FLORIDA
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HALL OF FAME

TACTICAL FLYING

OVER TWENTY-EIGHT YEARS

170 AREFG, McGuire (NJANG)	Feb. '56

OVER TWENTY-SIX YEARS

171 AREFW, Greater Pittsburgh (PAANG)	Mar. '58

OVER TWENTY-FIVE YEARS

157 AREFG, Pease (NHANG)	Jun '58

OVER TWENTY-FOUR YEARS

940 AREFG, Mather (USAFR)	May '59
307 AREFG, Travis	Sept. '59

OVER TWENTY-THREE YEARS

151 AREFG, Salt Lake City (UTANG)	Feb. '61

OVER TWENTY-TWO YEARS

134 AREFG, McGhee Tyson (TNANG)	Aug. '61
11 SG, Fairford	Feb. '62

OVER TWENTY-ONE YEARS

340 AREFG, Altus	Jun '62
96 BMW, Dyess	Aug. '62

OVER NINETEEN YEARS

160 AREFG, Rickenbacker (OHANG)	Dec. '64

OVER EIGHTEEN YEARS

320 BMW, Mather	Jul '65

OVER SEVENTEEN YEARS

452 AREFW, March (USAFR)	Sept '66
92 BMW, Fairchild	Feb '67

OVER SIXTEEN YEARS

55 SRW, Offutt	Jul '67
2 BMW, Barksdale	Aug '67

OVER FIFTEEN YEARS

5 BMW, Minot	Feb '69

OVER FOURTEEN YEARS

42 BMW, Loring	Sep '69
141 AREFW, Fairchild (WAANG)	Oct '69

OVER THIRTEEN YEARS

28 BMW, Ellsworth	May '70

OVER TWELVE YEARS

101 AREFW, Bangor (MEANG)	Mar '72

OVER ELEVEN YEARS

306 SW, Mildenhall	Apr '72
416 BMW, Griffiss	May '72
305 AREFW, Grissom	Aug '72

OVER TEN YEARS

379 BMW, Wurtsmith	Apr '73

OVER NINE YEARS

931 AREFG, Grissom (USAFR)	Feb '74
384 AREFW, McConnell	Mar '74
189 AREFG, Little Rock (ARANG)	May '74
43 SW, Andersen	Dec '74

OVER EIGHT YEARS

68 AREFG, Seymour Johnson	Sep '75

OVER SIX YEARS

410 BMW, K.I. Sawyer	Apr '77
190 AREFG, Forbes (KSANG)	Apr '77
128 AREFG, Milwaukee (WIANG)	Jul '77

OVER FOUR YEARS

376 SW, Kadena	Aug '79

ICBM

OVER NINETEEN YEARS

1 STRAD, Vandenberg	Sept '64

OVER THIRTEEN YEARS

341 SMW, Malmstrom	Apr '70

OVER ELEVEN YEARS

321 SMW, Grand Forks	Aug '72

OVER TEN YEARS

390 SMW, Davis-Monthan	Jul '73

OVER NINE YEARS

351 SMW, Whiteman	Oct '74
91 SMW, Minot	Nov '74

OVER FIVE YEARS

381 SMW, McConnell	Aug '78
44 SMW, Ellsworth	Nov '78

To gain listing in the Hall of Fame, a SAC or ARF unit must be Class A mishap-free for 48 months.